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Amendments to the Figures

Figures 1A and 1B have been amended by adding the label "(Background)" below each Figure label, as required by the Examiner. A Replacement Sheet (as required by 37 C.F.R. 1.121(d)) is attached to this Amendment.

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Remarks

Applicant and his representatives wish to thank Examiner Pert for the examination of the present application and the explanations in the Office Action dated October 28, 2005.

The present invention relates to a method for fabricating a semiconductor device. The method (as set forth in Claim 1) generally includes the steps of (a) forming a nitride layer on an interlayer insulating layer, (b) forming a photoresist layer on the nitride layer (c) forming a photoresist pattern from the photoresist layer, (d) etching the nitride layer using the photoresist pattern as a mask, (e) simultaneously etching the photoresist pattern and the interlayer insulating layer, and (f) setting an etch stop point as a point at which the photoresist pattern is removed by etching. Alternatively, with respect to independent claim 10, a step of setting an etch stop point may comprise setting an etch stop point as a point at which the nitride layer is exposed.

With respect to independent Claim 5, the method generally includes the steps of (a) forming a first mask layer on an etch target layer, (b) forming a second mask layer on the first mask layer, (c) forming a first mask pattern by selectively etching the second mask layer, (d) forming a second mask pattern by etching the first mask layer using the first mask pattern as a mask, (e) etching the first mask pattern and the etch target layer using the second mask pattern as a mask, and (f) setting an etch stop point as a point at which the first mask pattern is removed by etching. Alternatively, with respect to independent Claim 11, a step of setting an etch stop point may comprise setting an etch stop point as a point at which the second mask pattern is exposed.

A person skilled in the art is capable of using the present invention based on the original specification without undue experimentation. Furthermore, the subject matter of the claims is described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the claimed invention. Consequently, the present claims are enabled and patentable.

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**The Rejections of Claims 1-11 under the Enablement Requirement of
35 U.S.C. § 112, First Paragraph**

The rejection of Claims 1-11 under 35 U.S.C. § 112, first paragraph is improper, and should be withdrawn. "The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation." *United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) (see MPEP § 2164). It is well within the capabilities of a person skilled in the art to select specific mask materials (e.g., photoresists and nitrides), etch target (e.g., interlayer insulation) materials, and specific etch processes and conditions, consistent with the Claims and the description of the present application, without undue experimentation.

It is well understood in the art that, generally, the assumption that the mask is not attacked by the etchant is only an idealized assumption. It is further well understood in the art that both the mask material and the underlying layer materials are generally etchable (see, e.g., Wolf, S., *Silicon Processing for the VLSI Era*, Lattice Press, 2002; particularly §§ 14.1.2 to 14.1.5, pp. 659-664, submitted herewith ["Wolf"]).

It was assumed [in prior sections] that the mask was not attacked by the etchant and did not consider that the layers under the etched film can also be attacked by the etchant. **In fact, both the mask material and the underlying layer materials are generally etchable.** These effects may play a significant role in specifying the etch processes. The underlying materials subject to etchant attack may be either the silicon wafer itself, or a film grown or deposited during a previous fabrication step. The ratio of etch rates of different materials is known as the *selectivity of an etch process*. This also implies that both the selectivity with respect to the mask material, and the selectivity with respect to the substrate materials are important characteristics of an etch process. *Wolf*, page 659, § 14.1.2; underlined emphasis added.

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Therefore, Applicant's undersigned representative understands that the knowledge in the art is that mask materials generally are etched (at least to a very small degree) during etch processing, and that this knowledge in the art is contradictory to the basis for this ground of rejection.

In fact, the cited reference (U.S. Patent No. 4,376,672 to Wang et. al ["Wang"]) fails to establish that a person skilled in the art believes or understands that photoresist masks (or any other masks) are not actually etched to some degree during the etching process. Applicant's undersigned representative has reviewed Wang, and is unable to identify any disclosure or teaching therein to the effect that masks are never etched during etch processes. FIGS. 2 and 5 of Wang show some undercutting of the photoresist layer and no apparent etching of that layer. These figures, however, are clearly approximations of the actual etching effect. As approximations, they are not inconsistent with Applicant's undersigned representative's understanding of the art. Furthermore, Wang specifically teaches a requirement for high etch rate selectivity, and thus teaches that etch rate selectivity is a factor to be considered (see, e.g., Wang, col. 4, lines 65-68). The selectivity of an etch process is the ratio of the etch rate of a target film to the etch rate of the mask material or the underlying material (see, e.g., Wolf, page 659, § 14.1.2, first paragraph). Therefore, Wang cannot be read to teach that photoresist "does not etch," and Wang cannot show that etch rate selectivity (the ratio of the etch rate of the target film to the etch rate of a photoresist or other mask material) is not well known in the art.

Wolf also teaches that etching selectivity between the mask and the target material is an important factor in selecting specific materials and a specific etching process (see, e.g., Wolf, § 14.1.2), and that the required selectivity with respect to the mask materials may be determined for specific mask materials, substrates, and etch processes (see, e.g., Wolf, §§ 14.1.3-14.1.4). Wolf does not appear to teach or suggest that etch selectivities of infinity are common, or even possible, as would be required if the basis for this ground of rejection is accurate or correct.

Thus, it is well understood that photoresist layers are generally etched by an etchant of an inorganic insulating layer, and that the etching speed of the photoresist layer is generally slower than that of the inorganic insulating layer. Therefore, as described in the present application,

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when the second (photoresist) mask layer is thick enough, it can be used as an etching mask (e.g., to etch the first [nitride] mask layer, see paragraph [0014] of the original description), and when etching time is long enough, the photoresist layer can be completely etched along with the target (inorganic) insulating layer (e.g., to expose the first [nitride] mask layer to determine the etch end point, see, e.g., paragraph [0015] of the original description).

Therefore, it is well within the abilities of a person skilled in the art to select specific mask materials (e.g., photoresists and nitrides), specific etch target (e.g., interlayer insulator) materials, and specific etch processes (or to select specific thicknesses of each of the materials consistent with the known selectivity ratios of an etch process for specific materials) in order to carry out the steps of the present invention. Accordingly, Claims 1-11 are fully enabled, and the rejection of Claims 1-11 under 35 U.S.C. § 112, first paragraph should be withdrawn.

**The Rejections of Claims 5-9 under the Written Description Requirement of
35 U.S.C. § 112, First Paragraph**

The rejection of Claims 5-9 under 35 U.S.C. § 112, first paragraph is improper, and should be withdrawn.

Independent Claim 5 relates to a method for fabricating a semiconductor device, including the steps of (a) forming a first mask layer on an etch target layer, (b) forming a second mask layer on the first mask layer, (c) forming a first mask pattern by selectively etching the second mask layer, (d) forming a second mask pattern by etching the first mask layer using the first mask pattern as a mask, (e) etching the first mask pattern and the etch target layer using the second mask pattern as a mask, and (f) setting an etch stop point as a point at which the first mask pattern is removed by etching. As shown above with respect to enablement of Claims 1-11, selectivity ratios in etch processes (and more specifically, the etch selectivity of a substrate [e.g., an etch target layer] to a mask) are well understood in the art.

Therefore, it is well within the abilities of a person skilled in the art to apply the teaching of the original Claims 5-9 to select first and second mask materials, etch target layer materials,

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and etch processes such that the first mask pattern is removed at the desired etch stop point (e.g., when a desired amount of the etch target layer is removed). Accordingly, the rejections of Claims 5-9 under 35 U.S.C. § 112, first paragraph should be withdrawn.

The Objections to the Drawings and the Specification

The objections to the Drawings, the Title, and the Field of the Disclosure have been obviated by appropriate amendment.

The objection to the specification, as identified in paragraph 5 of the Office Action, is not well-founded. A person skilled in the art is capable of understanding the invention, as described above with respect to the rejections of Claims 1-11 and 5-9 under 35 U.S.C. § 112, first paragraph. Furthermore, Applicant's undersigned representative is unaware of any statutory or regulatory requirement for an example of a combination that can be used for practicing the invention. The Examiner's assistance in identifying such a statute or regulation is respectfully requested.

Therefore, the grounds of objection are no longer sustainable, and should be withdrawn.

Conclusions

In view of the above amendments and remarks, all bases for objection and rejection are believed to be overcome, and the application is believed to be in condition for allowance. Early notice to that effect is earnestly requested.

If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

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Respectfully submitted,



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